

claims renumbered - 37 CFR 1.126

CLAIMS

1. A method of operating a cooling and heating circuit of a motor vehicle driven by an internal combustion engine, comprising the steps of providing a first cooling medium path through a bypass conduit, a second cooling medium path through a main cooler of the internal combustion engine, a third cooling medium path through a heating heat exchanger; subdividing the cooling medium paths by electrically actuated valves and forming the cooling medium flows by an electrically driven pump; controlling both the valve and the pump by an electronic control unit in dependence on operational and environmental parameters as well as nominal values; reversing a feeding direction of the electrically operated pump in a first operational phase of the internal combustion engine at low temperatures of the internal combustion engine and turned on first cooling medium path; and feeding the cooling medium by the pump in a lower region of the internal combustion engine.

2. A method as defined in claim 1; and further comprising providing a fourth cooling medium path through an oil heat exchanger.

3. A method as defined in claim 1; and further comprising detecting at least one parameter selected from the group consisting of a time of the year, an operational location of the internal combustion engine and both; and evaluating said at least one parameter for regulation of the cooling medium flows by the control unit.

4. A method as defined in claim 3; and further comprising using for detection of the time of the year a component selected from the group consisting of a board clock, a board computer, and both.

5. A method as defined in claim 3; and further comprising using for detection of the operational location of the internal combustion engine at least one navigation device.

6. A method as defined in claim 1; and further comprising opening one of the valves toward a heating circuit at cold outside temperatures.

7. A method of operating a cooling and heating circuit of a motor vehicle driven by an internal combustion engine, comprising the steps of providing a first cooling medium path through a bypass conduit, a second cooling medium path through a main cooler of the internal combustion engine, a third cooling medium path through a heating heat exchanger; subdividing the cooling medium paths by electrically actuated valves and forming the cooling medium flows by an electrically driven pump; controlling both the valves and the pump by an electronic control unit in dependence on operational and environmental parameters as well as nominal values; and preventing a cooling medium feeding by closing the valves in a first operational phase of the internal combustion engine at low temperatures of the internal combustion engine, by a thermal syphon action.

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8. A method of operating a cooling and heating circuit of a motor vehicle driven by an internal combustion engine, comprising the steps of providing a first cooling medium path through a bypass conduit, a second cooling medium path through a main cooler of the internal combustion engine, a third cooling medium path through a heating heat exchanger; subdividing the cooling medium paths by electrically actuated valves and forming the cooling medium flows by an electrically driven pump; controlling both the valves and the pump by an electronic control unit in dependence on operational and environmental parameters as well as nominal values; reducing a cooling medium feeding by closing one of the valves at cold outside temperatures in a first operational phase of the internal combustion engine at low temperatures; and opening the other valve to a heating circuit.

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9. A cooling and heating circuit of a motor vehicle driven by an internal combustion engine, comprising a bypass conduit through which a first cooling medium path extends; a main cooler of the internal combustion engine through which a second cooling medium path extends; a heating heat exchanger through which a third cooling medium path extends; electrically operated valves which subdivide the cooling medium paths; an electrically driven pump which provides cooling medium flows; an electronic control device which controls said valves and said pump depending on operational

and environmental parameters so that a feeding direction of said electrically driven pump in a first operational phase of the internal combustion engine at low temperatures of the internal combustion engine and with the first cooling medium path turned on is reversed, and said pump supplies a cooling medium in a lower region of said internal combustion engine.

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10/18. A cooling and heating circuit as defined in claim 9/17, wherein said bypass conduit of said first cooling medium path is short.

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11/19. A cooling and heating circuit 9/17, wherein said bypass conduit extends in a housing of the internal combustion engine.

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12/20. A cooling and heating circuit 9/17, wherein said bypass conduit is heat insulated.

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21. A cooling and heating circuit of a motor vehicle driven by an internal combustion engine, comprising a bypass conduit through which a first cooling medium path extends; a main cooler of the internal combustion engine through which a second cooling medium path extends; a heating heat exchanger through which a third cooling medium path extends; electrically operated valves which subdivide the cooling medium paths; an electrically driven pump which provides cooling medium flows; an electronic control device which controls said valves and said pump depending on operational and environmental parameters, so that in a first operational phase of the internal combustion engine at low temperatures of the internal combustion engine a cooling medium supply is prevented by thermal syphon action by closing of one of said valves and closing of the other of said valves.

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22. A cooling and heating circuit as defined in claim 21, wherein said bypass conduit of said first cooling medium path is short.

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23. A cooling and heating circuit 21, wherein said bypass conduit extends in a housing of the internal combustion engine.

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24. A cooling and heating circuit 21, wherein said bypass conduit is heat insulated.

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25. A cooling and heating circuit of a motor vehicle driven by an internal combustion engine, comprising a bypass conduit through which a first cooling medium path extends; a main cooler of the internal combustion engine through which a second cooling medium path extends; a heating heat exchanger through which a third cooling medium path extends; electrically operated valves which subdivide the cooling medium paths; an electrically driven pump which provides cooling medium flow; an electronic control device which controls said valves and said pump depending on operational and environmental parameters, so that at cold outside temperatures in a first operational phase of the internal combustion engine at low temperatures a

cooling medium supply is reduced by thermal syphon action with one of said valves closed, and the other of said valves is open to a heating circuit.

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~~26~~. A cooling and heating circuit as defined in claim ~~25~~,¹⁷

wherein said bypass conduit of said first cooling medium path is short.

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~~27~~. A cooling and heating circuit ~~25~~,¹⁷ wherein said bypass

conduit extends in a housing of the internal combustion engine.

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~~28~~. A cooling and heating circuit ~~25~~,¹⁷ wherein said bypass

conduit is heat insulated.